Malaria in Open and Closed Communities in Namrole, Buru Selatan District, Maluku Island, Indonesia

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ABSTRACT

Malaria remains a public health problem in Buru Selatan District, an area with opened and closed communities. This study aimed to describe malaria prevalence and its related factors in opened and closed communities in Namrole, Buru Selatan District. This study was a cross sectional study to measure prevalence of malaria in open and close communities of Buru Selatan District. Study location was in Namrole Sub-District. Subject was selected by purposive sampling, consisted of 128 subjects (64 subjects from opened community and 64 subjects from closed community). Malaria was diagnosed by thin and thick blood smear. Data was presented as proportion. Statistical analysis used Chi-Square to analyse the data. Characteristics of subject (age, gender, occupation) were equal between malaria and non-malaria subjects, except for age in closed community. Prevalence of malaria in this study was 33.6% decrease from the prevalence a year earlier (35.5%). Malaria in closed community was higher than opened community and was clustered in forest. In general, malaria did not relate to behavior although taking medicine differs between malaria and non-malaria group. Malaria in closed community is higher than opened community, mostly asymptomatic, and clustered in forest. The closed community is an area with traditional life and lack of health facilities. This condition is a challenge in malaria elimination program.

Keywords: *malaria, opened and closed community, traditional life*

INTRODUCTION

Malaria is a disease caused by the Plasmodium parasite, which is transmitted from person to person by infected female *Anopheles* mosquitoes[(1)]. In 2016, 90 countries and areas had ongoing malaria transmission. There were 216 million cases of malaria in 2016. The cases were increasing from 211 million cases in 2015. The estimated number of malaria deaths in 2016 was 445 000 in 2016, almost similar number to the previous year (446 000).[(2)]

Buru Selatan District is a malaria endemic area in Indonesia. From 2011-2014, there were 477, 208, 361, and 494 malaria cases were reported respectively. Annual blood examination rate (ABER) was 0.91, 0.53, 0.69 and 1.12% respectively. Slide positive rate (SPR) was 72.49, 54.02, 71.91 and 90.91% from 2011-2014. While annual parasite rate (API) was 6.63, 2.89, 5.01 and 6.86% respectively.[(3)]

There are two communities in Buru Selatan District, open and closed. Closed community is society lives in remote countryside areas, with limited infrastructures. This community lives a traditional vegetative life and depends on nature around. In traditional community, if any family member experiences malaria, they usually use a traditional medicine from natural herbs that surround it.[(4)] Open community, on the other hand, is society that mostly driven by present's cultural orientation and civilization. They live in urban areas, so called urban society.[(5)] This study aimed to describe malaria prevalence and its related factors in opened and closed communities in Buru Selatan District.

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MATERIAL AND METHODS

This cross sectional study measured prevalence of malaria in open and close communities of Buru Selatan District. Selection of the study site was based on two categories: 1. Open or closed community, 2. High endemic of malaria. Selected study sites were Namrole District, which consisted of opened and closed communities. Subject was selected by purposive sampling. Inclusion criteria was subject with malaria, either symptomatic or asymptomatic.This study consisted of 128 subjects, divided into 64 subjects from opened community and 64 subjects from closed community. Written informed consent was acquired from all subjects. The survey was conducted in May-August 2015.

Malaria was diagnosed by thin and thick blood smear. A volume of 50 µL bloods was drawn by finger prick using microtainer BD blue. The blood from each individual was collected in a slide and prepare for thin and thick blood smear. Malaria was diagnosed if Plasmodium is detected by microscope. Data was presented as proportion. Statistical analysis used Chi-Square to test the difference between positive and negative cases based on sex, age, level of education, occupation and behaviour.

FINDINGS

This study revealed characteristics of subject were equal between malaria and non-malaria subjects ($p>0.05$), except for age in closed community ($p=0.011$), as seen in Table 1.

Table 1: Characteristics of study subjects

Characteristics	Total			Open community			Closed community		
	Mal (+) n (%)	Mal (-) n (%)	p value	Mal (+) n (%)	Mal (-) n (%)	p value	Mal (+) n (%)	Mal (-) n (%)	p value
Gender									
- Male	24(40.0)	36 (60.0)	0.149	8 (27.6)	21 (72.4)	0.565	16 (51.6)	15 (48.4)	0.011
- Female	1 (27.9)	49 (72.1)		12 (34.3)	23 (65.7)		7 (21.2)	26 (78.8)	
Age									
- 0-10	26 (36.1)	46 (63.9)	0.197	11 (37.90	18 (62.1)	0.133	15 (34.9)	38 (65.1)	0.643
- 11-20	6 (40.0)	9 (60.0)		3 (33.3)	6 (66.7)		3 (50.0)	3 (30.0)	
- 21-30	3 (15.8)	16 (82.2)		1 (10.0)	9 (90.0)		2 (22.2)	7 (77.8)	
- 31-40	3 (27.3)	8 (72.7)		1 (12.5)	7 (87.5)		2 (66.7)	1 (33.3)	
- 41-50	3 (33.3)	6 (66.7)		2 (33.3)	4 (66.7)		1 (33.3)	2(66.7)	
- >50	2 (100.0)	0 (0.0)		2 (100.0)	0 (0.0)		-	-	
Occupation									
- Civil servant	1 (33.3)	2 (66.7)	0.946	1 (33.3)	2 (66.7)	0.725	-	-	0.782
- Merchants	2 (50.0)	2 (50.0)		1 (50.0)	1 (50.0)		1 (50.0)	1 (50.0)	
- Farmers	8 (28.6)	20 (71.4)		4 (25.0)	12 (75.0)		4 (33.3)	8 (66.7)	
- Fishermen	0 (0.0)	1 (100.0)		0 (0.0)	1 (100.0)		-	-	
- Housewife	0(0.0)	3 (100.0)		0 (0.0)	3 (100.0)		-	-	
- Unemployed	9 (35.4)	53 (64.6)		14 (35.9)	25 (64.1)		15 (34.9)	28(65.1)	
- Hunter	3 (42.9)	4 (57.1)					3 (42.9)	4 (57.1)	

Note: Mal(+) = positive malaria; Mal(-) = negative malaria

In general, prevalence of malaria in this study was 33.6%, while a year earlier the prevalence was 25.6% in the same subjects. The current prevalence of malaria in closed community (36.0%) was higher than opened community (31.2%), as seen in Table 2. However, most of malaria in closed community was asymptomatic. In general, malaria did not relate to behavior (Table 3). Distributions of malaria cases in closed community, which can be seen in Figure 1, were clustered in forest area.

Table 2: Prevalence of malaria

Prevalence	Total		Open community		Closed community	
	n = 128	%	n = 64	%	n = 64	%
Current malaria						
Yes	43	33.6	20	31.2	23	36.0
No	85	66.4	44	68.8	41	64.0
Malaria a year ago						
Yes	11	25.6	8	40.0	3	13.1
No	32	74.4	12	60.0	20	86.9

Table 3: Relationship between history of malaria and current malaria status

Variables	Total			Open community			Closed community		
	Mal (+) n (%)	Mal (-) n (%)	p value	Mal (+) n (%)	Mal (-) n (%)	p value	Mal (+) n (%)	Mal (-) n (%)	p value
Experience fever, chill, headache									
Symptomatic	10 (22.2)	35 (77.8)	0.052	6 (20.0)	24 (80.0)	0.105	4 (26.7)	11 (73.3)	0.297
Asymptomatic	33 (39.8)	50 (60.2)		14 (41.2)	20 (58.8)		19 (38.8)	30 (61.2)	
Use traditional herb to cure malaria									
Yes	33 (37.1)	56 (62.9)	0.207	13 (28.9)	32 (71.1)	0.531	20 (45.5)	24 (54.5)	0.019
No	10 (25.6)	29 (74.4)		7 (38.8)	12 (63.2)		3 (15.0)	17 (85.0)	
History of using anti-malaria drugs within 1 years									
Yes	8 (28.6)	20 (72.4)	0.652	6 (31.6)	13 (68.4	1.000	2 (22.2)	7 (77.8)	0.470
No	35 (35.0)	65 (65.0)		14 (31.1)	31 (68.9)		21 (38.2)	34 (61.8)	
Current use of anti-malaria drugs									
Yes	17 (24.6)	52 (75.4)	0.025	6 (18.2)	27 (81.8)	0.030	11 (30.6)	25 (69.4)	0.431
No	26 (44.1)	33 (55.9)		14 (45.2)	17 (54.8)		12 (42.9)	16 (57.1)	
Traveling outside the area									
Yes	6 (27.3)	16 (72.7)	0.622	5 (26.3)	14 (73.7)	0.769	1 (33.0)	2 (66.7)	1.000
No	37 (34.9)	69 (65.1)		15 (33.3)	30 (66.7)		22 (36.1)	39 (63.9)	
Stay temporarily in another area or village									
Yes	9 (25.7)	26 (74.3)	0.297	7 (25.9)	20(74.1)	0.586	2 (25.0)	6 (75.0)	0.700
No	34 (36.6)	59(63.4)		13 (35.1)	24 (64.9)		21(37.5)	35 (62.5)	
Traveled outside the area within 1 year									
Yes	17 (32.7)	35 (67.3)	1.000	5 (22.7)	17 (77.3)	0.397	12 (40.0)	18 (60.0)	0.606
No	26 (34.2)	50 (65.8)		15 (35.7)	27 (64.3)		11 (32.4)	23 (676)	

Conted…

Traveled to neighboring village within 1 year									
Yes	19 (32.8)	39 (67.2)	1.000	10 (25.0)	30 (75.0)	0.178	9 (50.0)	9 (50.0)	0.160
No	24 (34.3)	46 (65.7)		10 (41.7)	14 (58.3)		14 (30.4)	32 (69.6)	
Traveled and stayed for several months in other areas									
Yes	35 (33.0)	71 (67.0)	0.806	12 (26.7)	33 (73.3)	0.250	23 (37.7)	38 (62.3)	0.547
No	8 (36.4)	14 (63.6)		9 (42.1)	11 (57.9)		0 (0.0)	3 (100.0)	
Travel history									
Yes	7 (22.6)	24(77.4)	0.137	7 (22.6)	24 (77.4)	0.150	-	-	-
No	36 (37.1)	61 (62.9)		13 (39.4)	20 (60.6)		23 (35.9)	41 (64.1)	

Note: Mal(+) = positive malaria; Mal(-) = negative malaria

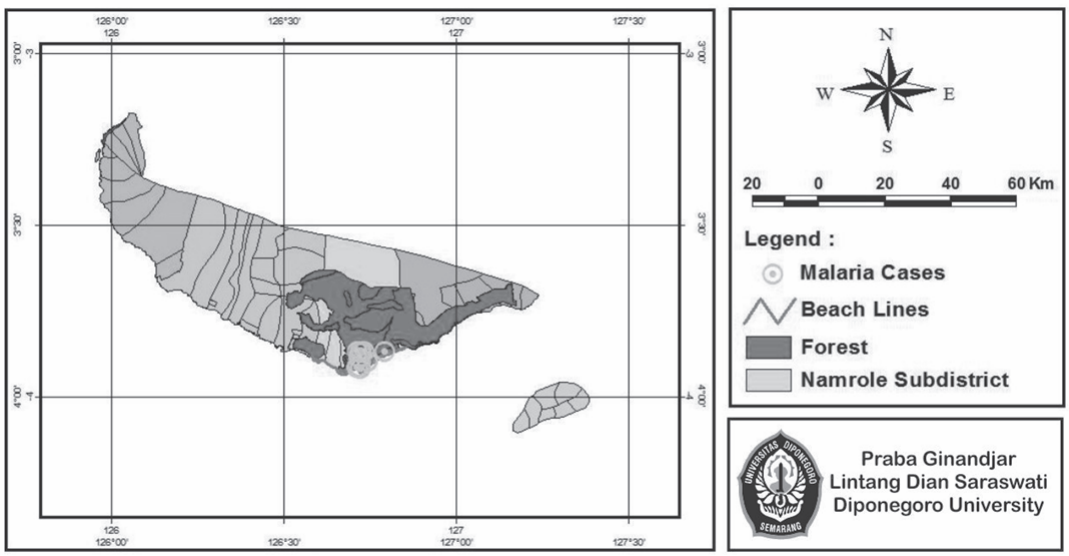

Figure 1: Distribution of malaria cases in open and closed communities

DISCUSSION

Malaria in closed community was higher than the opened one. This may due to the lack of health facilities in the closed community. Closed (or tribe) community inhabiting mountainous areas and surrounded by forests. This area has not undergone any environmental change, for example agricultural development, settlement, deforestation etc. No health facilities and personnel in closed community. A previous study highlighted the potential of the primary health care system in reaching those most at risk and reducing malaria burden.[6] A systematic review also revealed community health workers and related cadres had important preventive, case management and promotion roles in malaria interventions.[7]

Proportion of asymptomatic malaria was higher than symptomatic malaria. One potential explanation was malaria infections have been occurring for a long time in the study area. Immunity, such as antibody and T cell-mediated immune responses, parasite-induced tolerance, was suggested to involve in the asymptomatic state of malaria.[8] Most people in malaria endemic area are almost continuously exposed by Plasmodium, and the majority of infected adults rarely experience overt disease due to naturally acquired immunity.[9] The existence of asymptomatic malaria is a challenge

in malaria elimination program as the infections are usually undetectable and rarely treated.[10] The condition of closed community that does not have health facilities makes it more difficult for the malaria elimination program.

In closed community, proportion of malaria in male was significantly higher than female (p=0.011). Traditionally, males in Namrole have responsibility to support their family. The closed community lives as vegetative, utilizes nature, has a natural life, and is dependent on the environment. The agricultural system remains fairly traditional. They mostly work in the forest. This means they are often outdoors and exposed to mosquito bites. The data presented in a study, based on outdoor human landing collections, which clearly emphasized the importance of outdoor malaria transmission in the forest as well as in the village.[11] A previous study also revealed men working in the forests had much higher infection rates. Because men tend to engage in more agricultural and forest-related activities, the risk was most likely occupational.[10]

As expected, proportion of malaria cases in closed community that used traditional herb was three times higher than modern medicine (p=0.011). This study revealed closed community lives traditionally, so it can be predicted that they also prefer traditional medicine. In closed community, traditional herb usually is decentralized, so it is easily and quickly available to individuals in the community rather than traveling to urban for treatment in public health center. This result was in accordance with a previous study in traditional community, which prefers to use a natural herbs from surrounding environment.[4] A critical review proved the most common reasons for traditional medicine for malaria across the Asia-Pacific region are a lack of accessibility to conventional health services due to geographical and financial barriers.[9] Traditional medicine is usually community based. Healers are selected by a community process that emphasizes personal qualities. Because they are from the community, traditional healers usually know their patients personally, and are well acquainted with their backgrounds, lifestyles and cultural beliefs. [9] This makes the closed community more comfortable doing traditional medication.

On the contrary, proportion of malaria patients who take malaria drug in opened community was higher than those who does not take the drug (p=0.030). Opened community lives a modern live. There were also health facilities in the area, such as primary health care and hospital. They have easier access to health services than closed community. Full benefits of malaria treatment can only be achieved when a high proportion of patients with malaria have access to effective treatment.[12] Timely access to an authorized malaria drug within 24 hours after fever symptom has been proved to be an important determinant of effective malaria treatment.[13]

There was no significant relationship between travel history and malaria occurrence, both in opened and closed communities. Most malaria subjects rarely travel and spend more time living in their respective areas. This should be of concern to local malaria programs to provide good malaria services

Malaria in closed community was higher than opened community. The cases were mostly asymptomatic and clustered in forest. The closed community is an area with traditional life and lack of health facilities. This study may serve as baseline data on the importance of providing health facilities in closed community to support malaria elimination program.

CONCLUSION

Malaria in closed community is higher than opened community, mostly asymptomatic, and clustered in forest. The closed community is an area with traditional life and lack of health facilities. This condition is a challenge in malaria elimination program.

Conflict-of-interest statement: The authors declare that there is no conflict of interest related to this research.

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